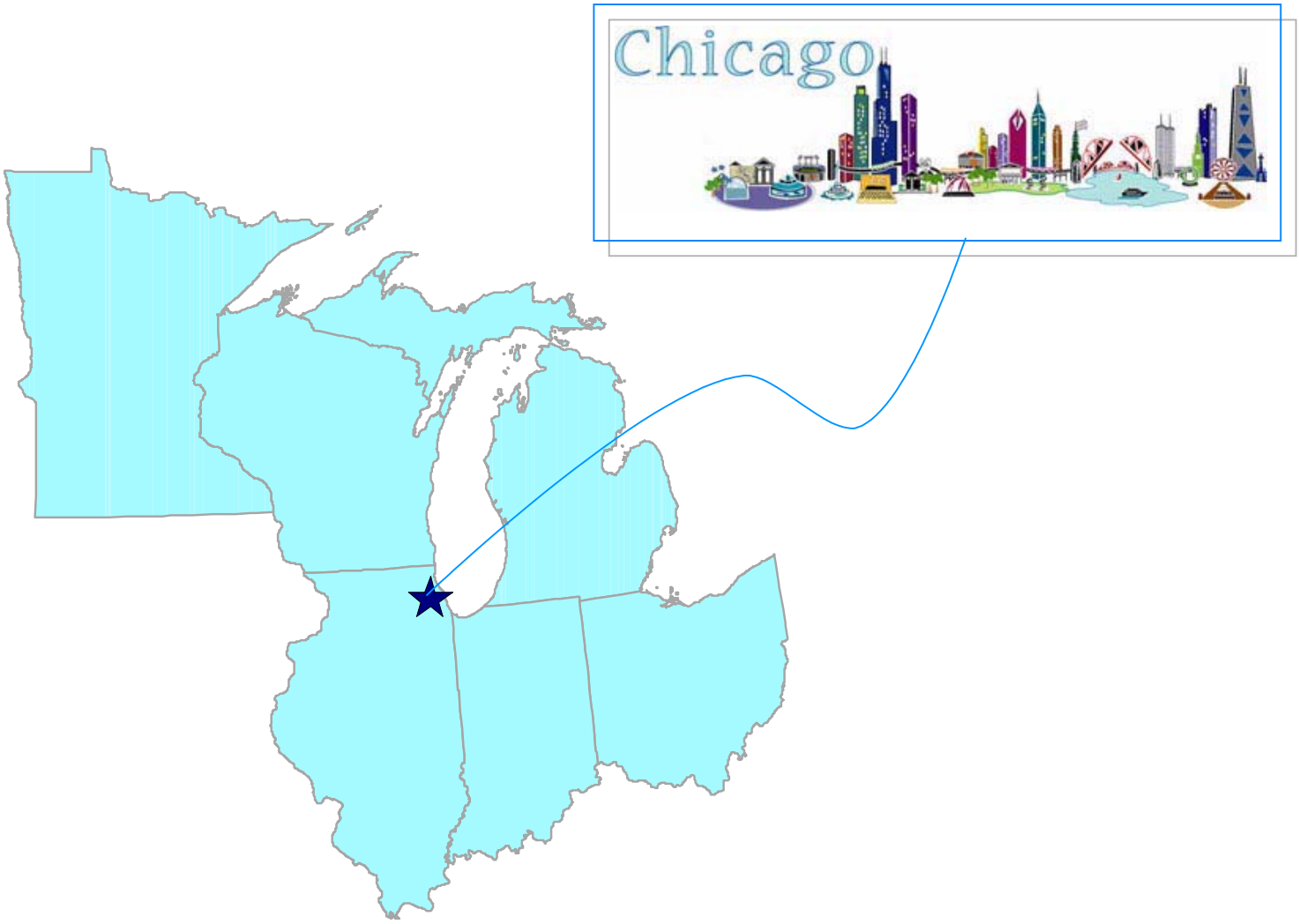
DESIGN YOUR OWN

AIR TOXICS MONITORING NETWORK

NETWORK #1:

LARGE-SCALE URBAN AREA


Chicago

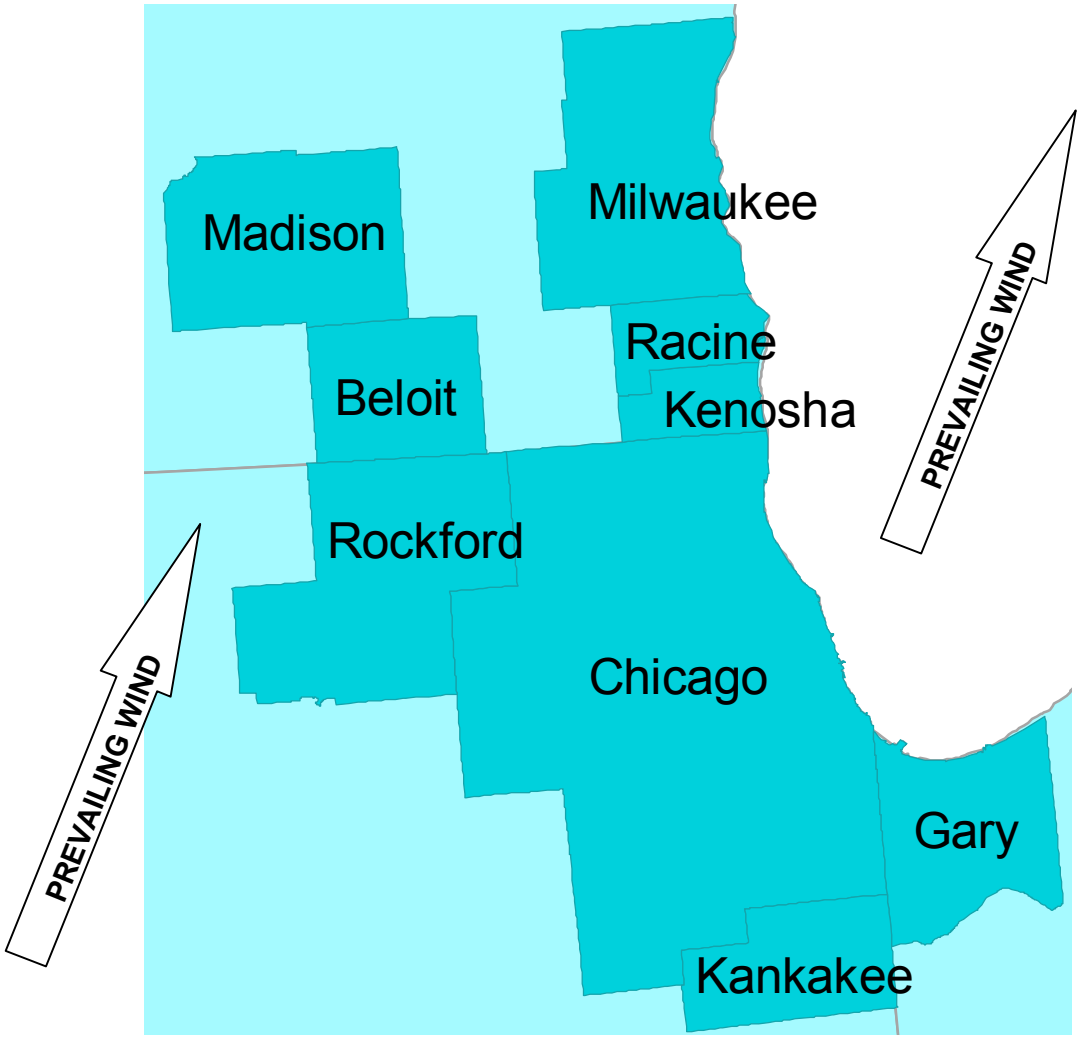
YOUR TASK:

- Design a large-scale urban air toxics monitoring network, in the spirit of MATES-II or the Bay Area network
- The objective of this network is to measure the HAPs of greatest concern in the most highly populated areas of "Chicagoland"
- Data should be useable for NATA validation, long term trends evaluation, and low-resolution exposure assessment

DON'Ts and DOs

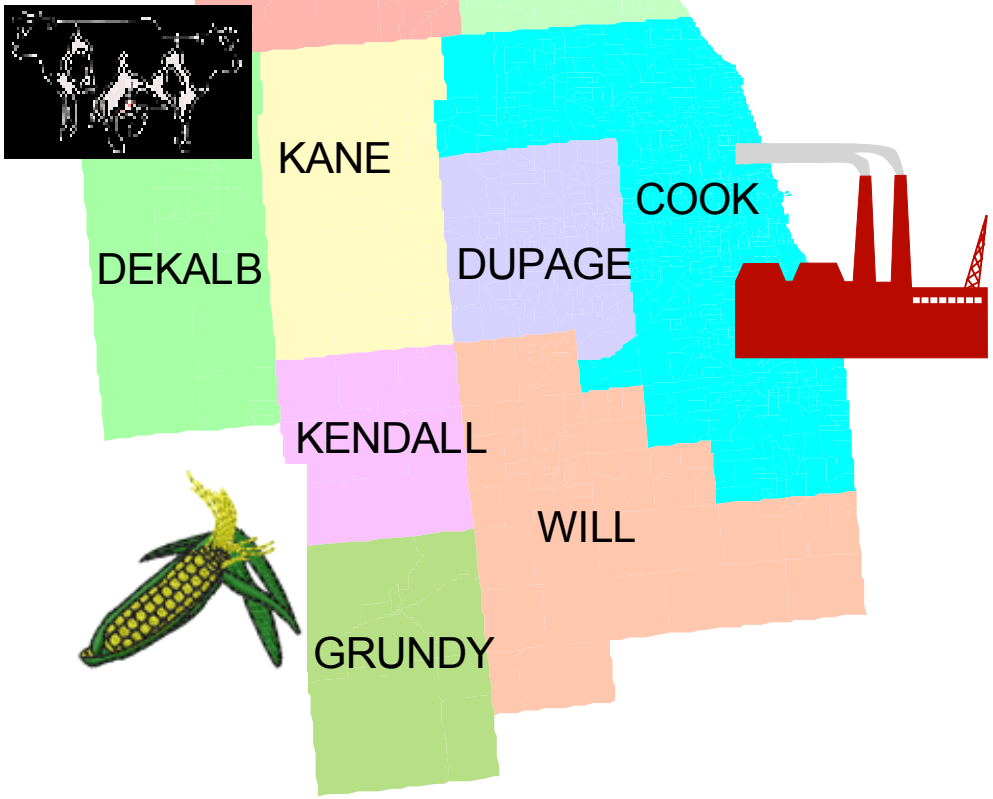
- **DON'T**
  - pick sites in industrial hotspots (microscale)
  - worry about sampling all HAPs at all sites
- **DO**
  - pick ***neighborhood scale*** sites (0.5 - 4km)
  - select your priority pollutants and determine how they vary spatially; need many or few sites?
  - include diverse sites in terms of location, population demographics, and pollutant sources
  - try to use existing sites; collocate equip.

MSAs in the Chicago vicinity

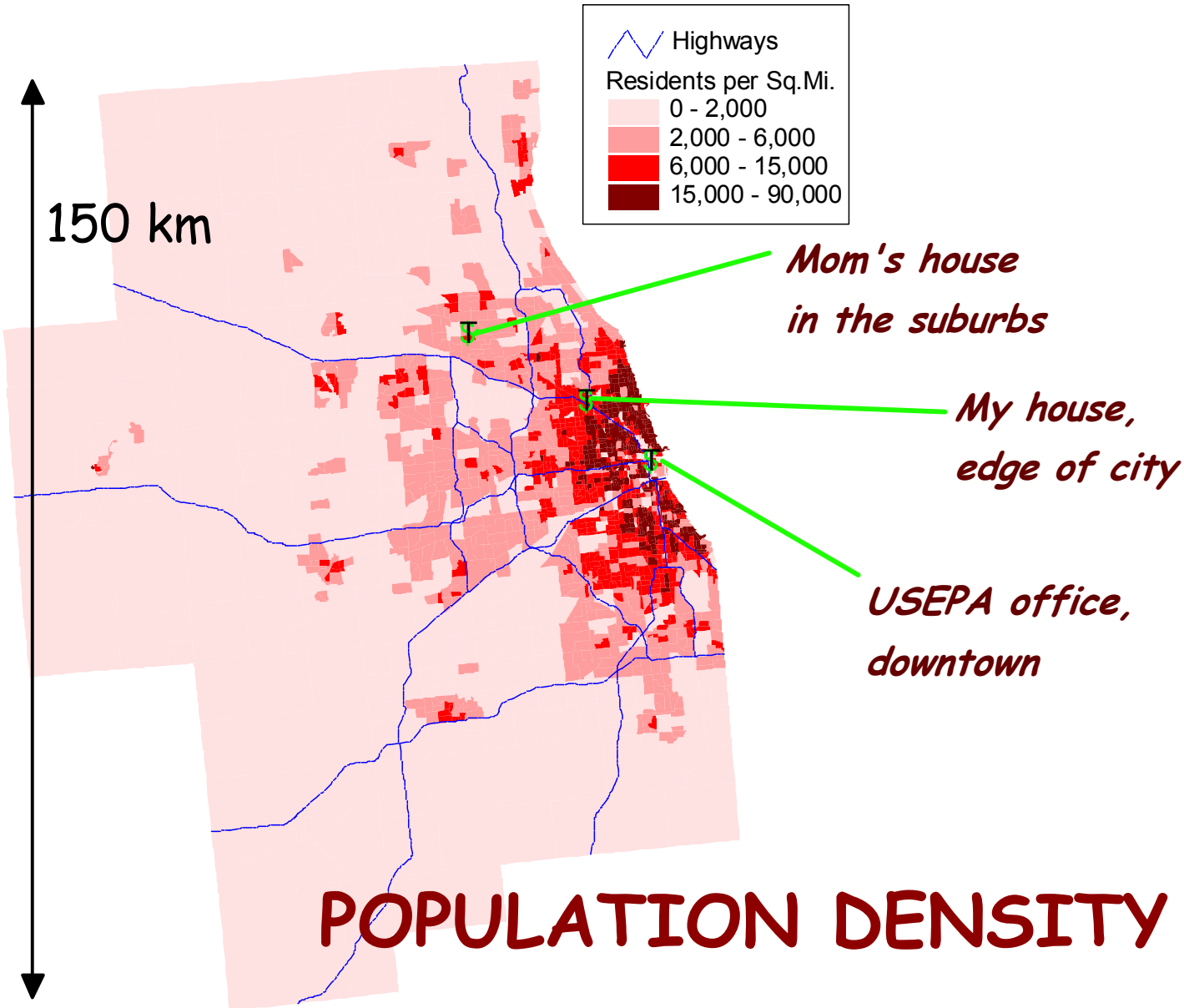


9 COUNTIES

in the Chicago MSA

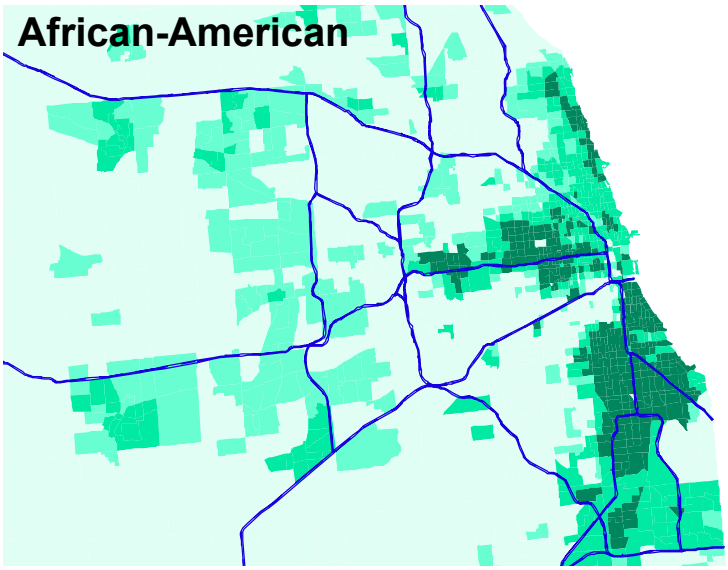


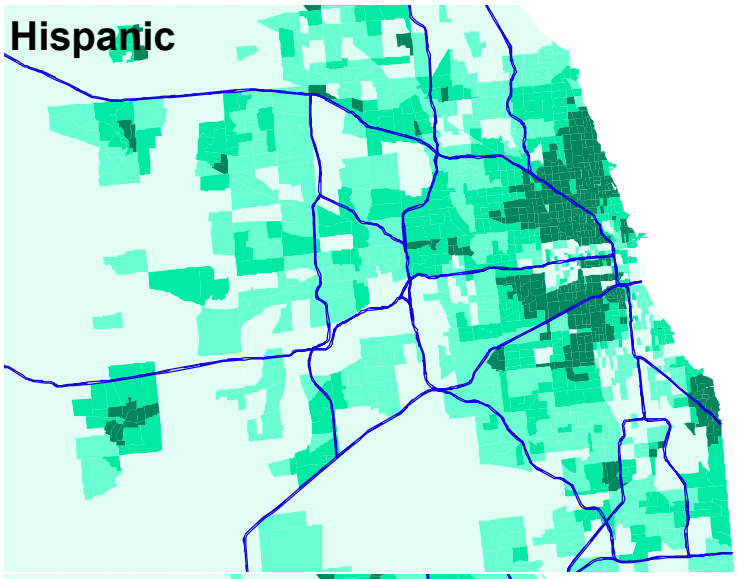
150 km

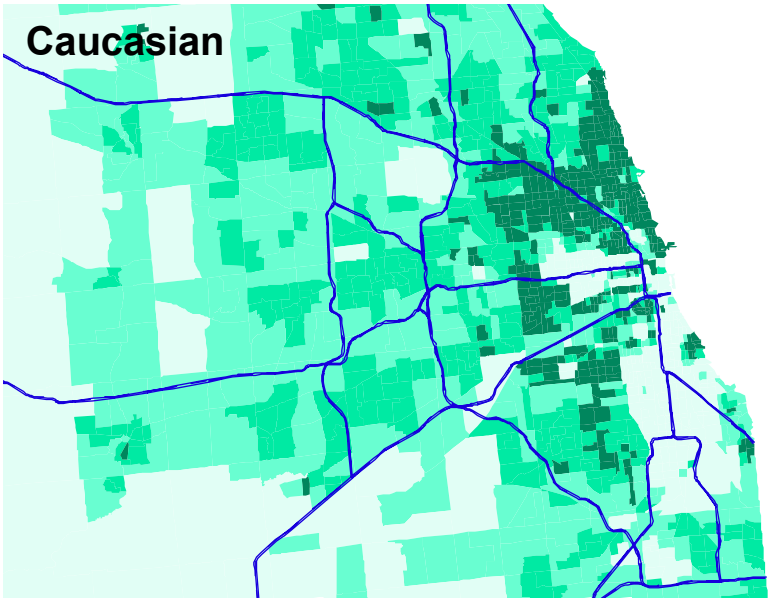


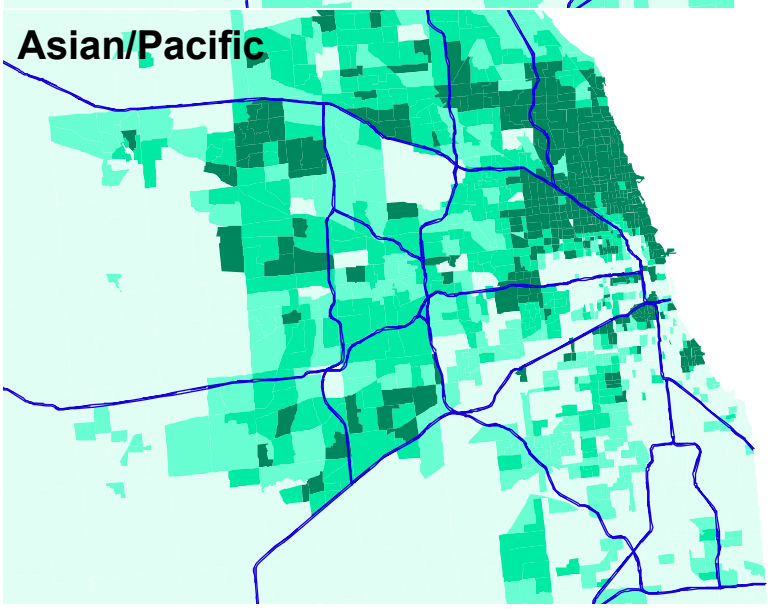
POPULATION DENSITY

DENSITY, BY DEMOGRAPHIC GROUP (quartile ranges)



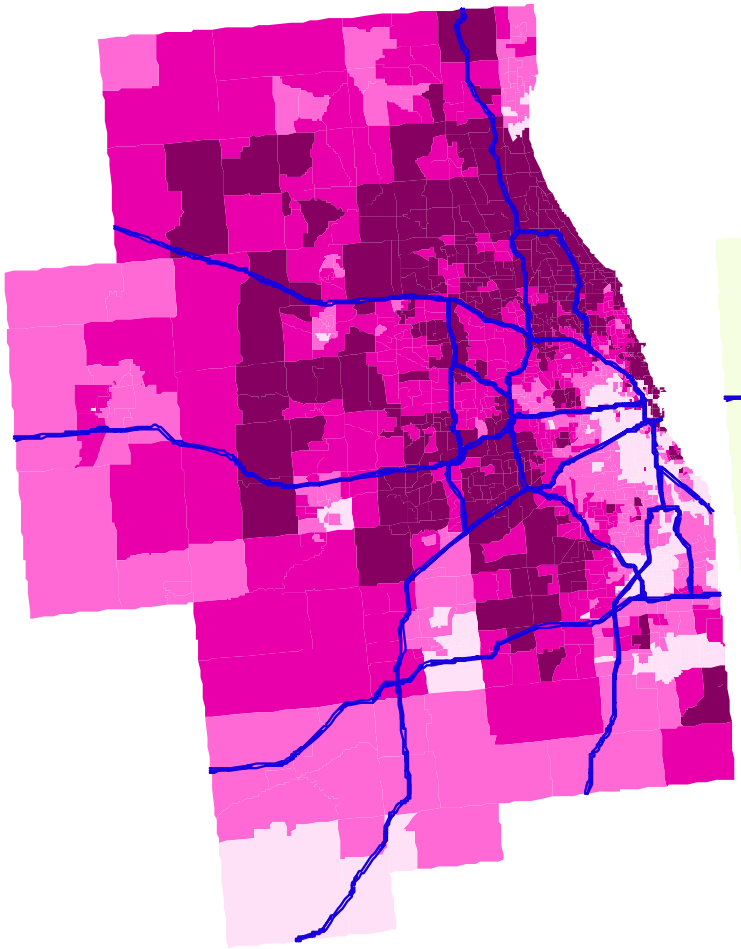




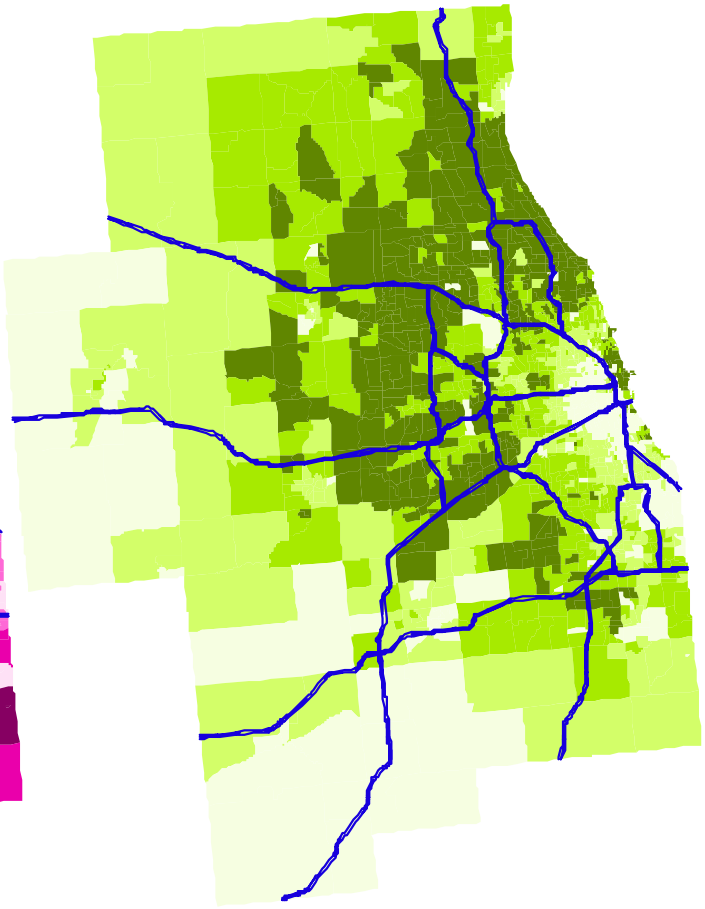


ECONOMICS (quartile ranges)

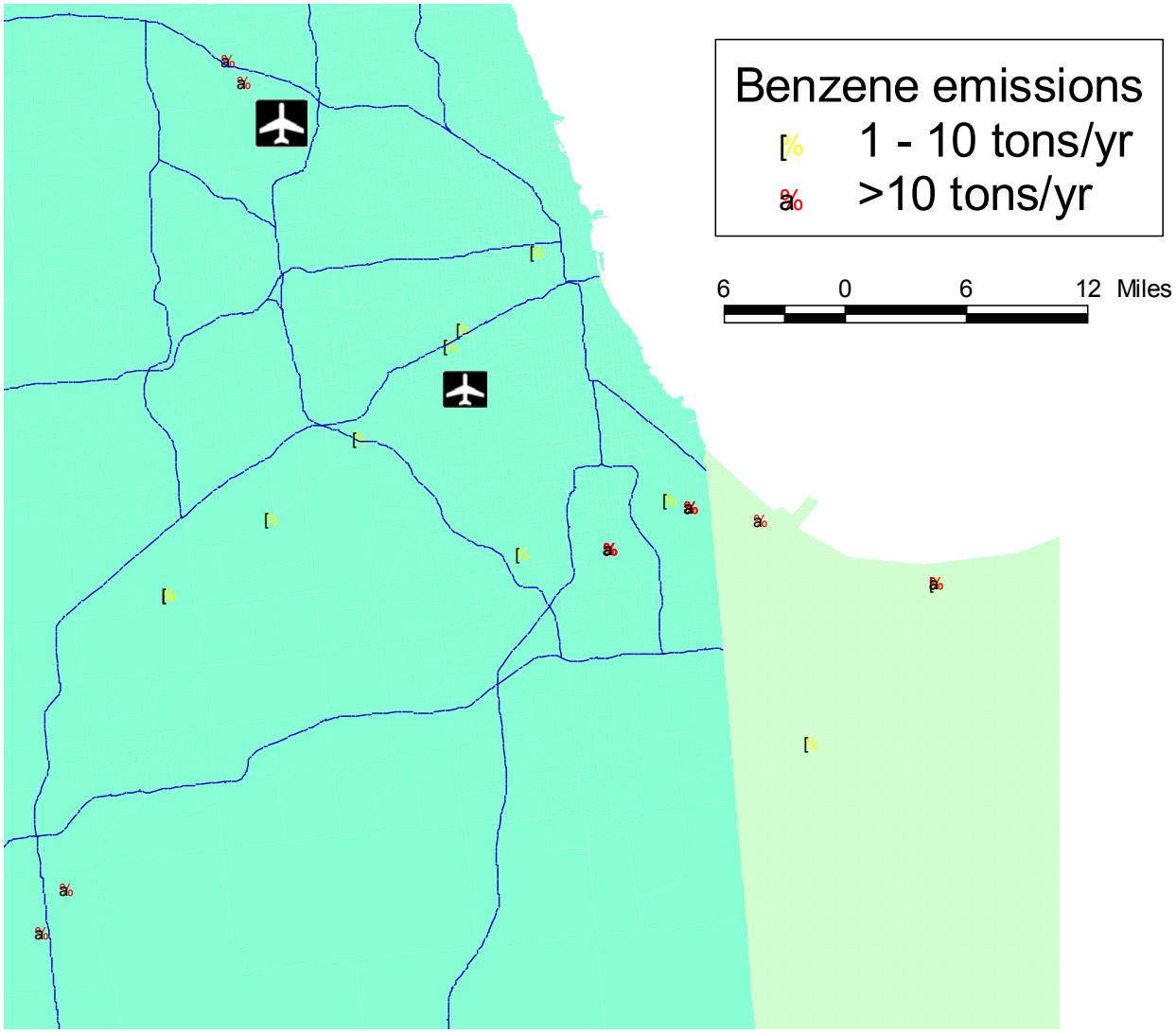
Property Values



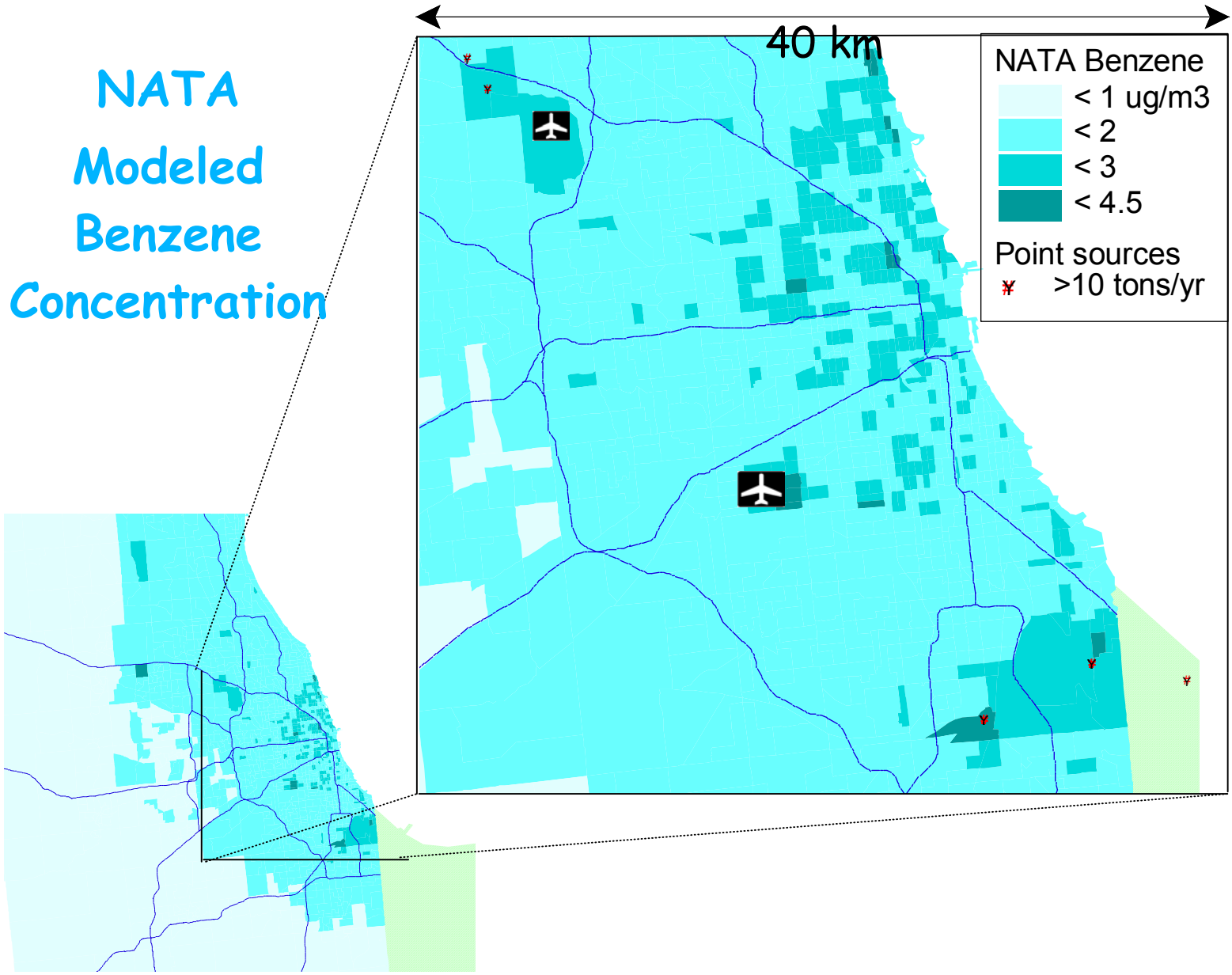
Median Rent



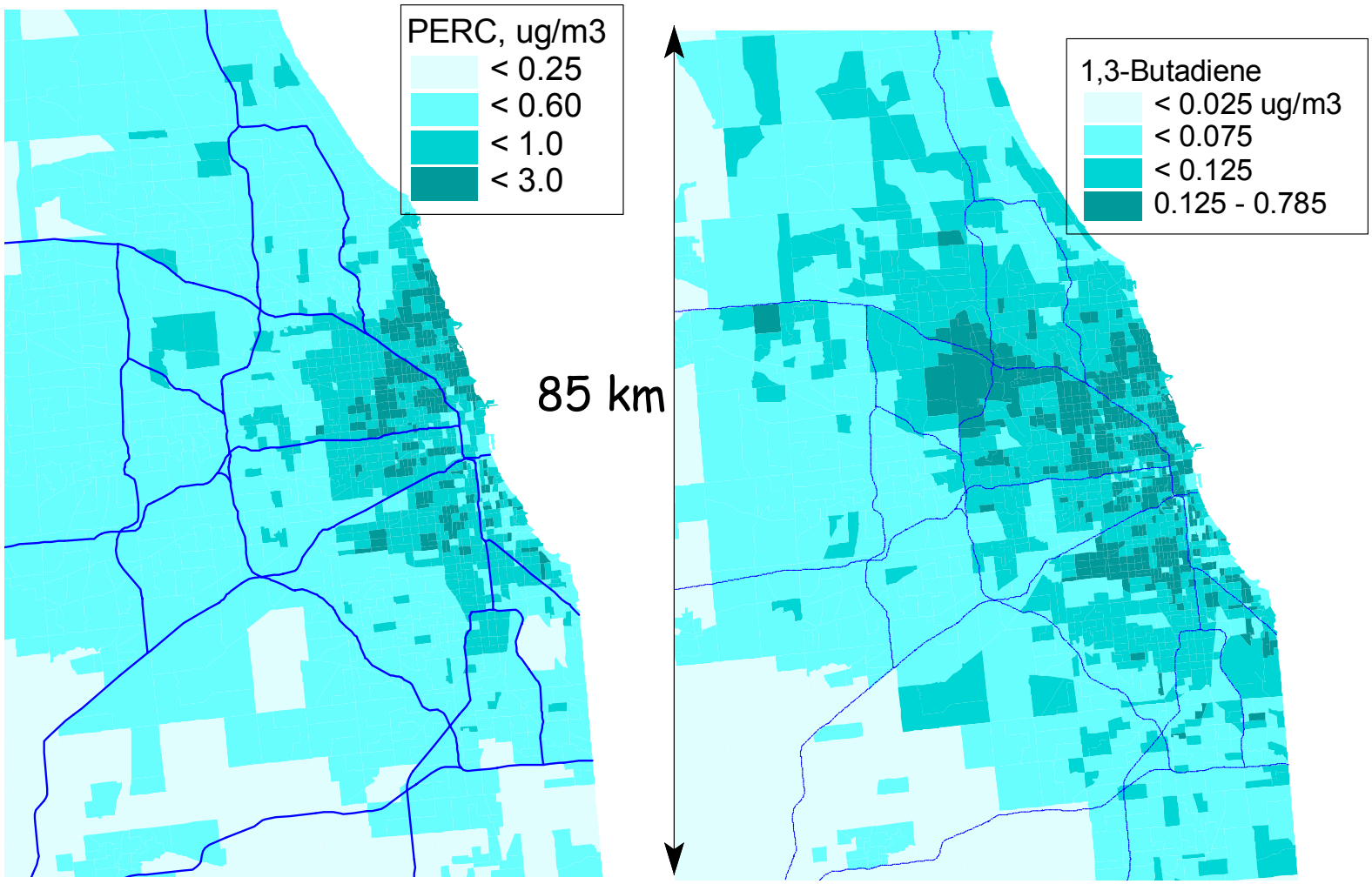
Significant Benzene Sources



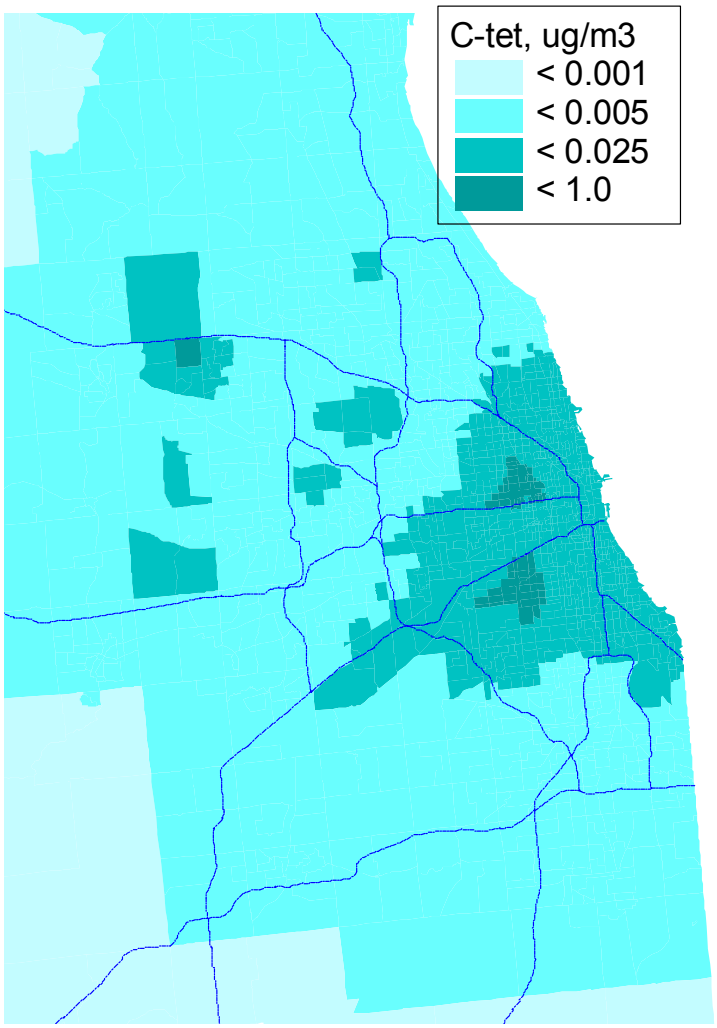
NATA Modeled Benzene Concentration

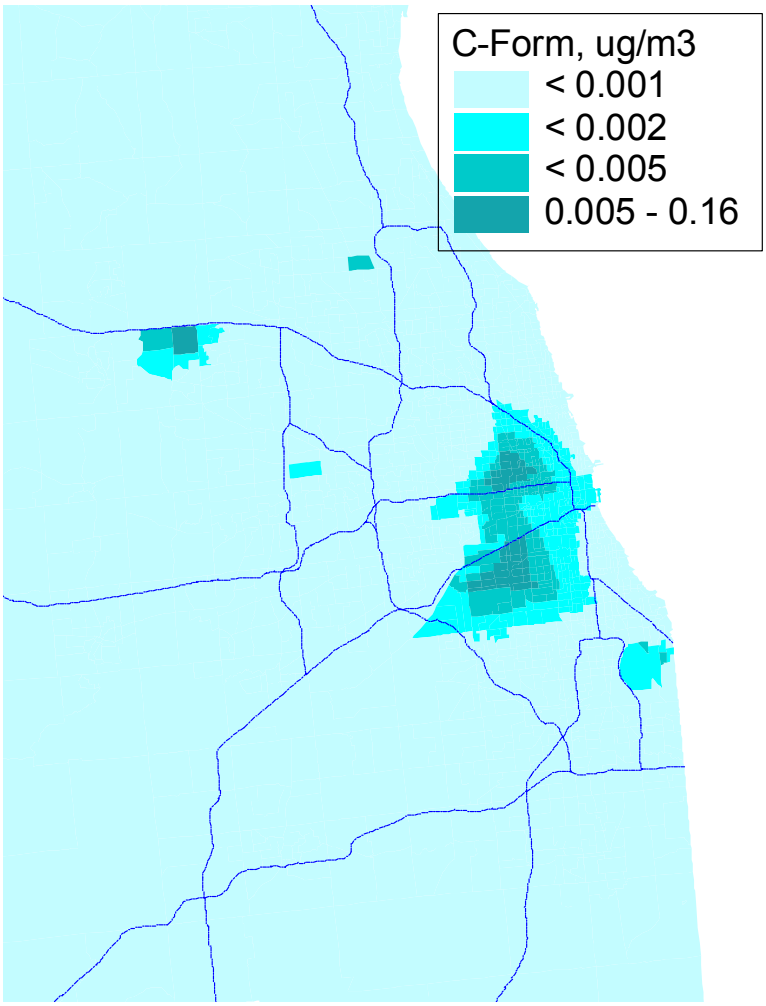


NATA VOCs: PERC, 1,3-Butadiene

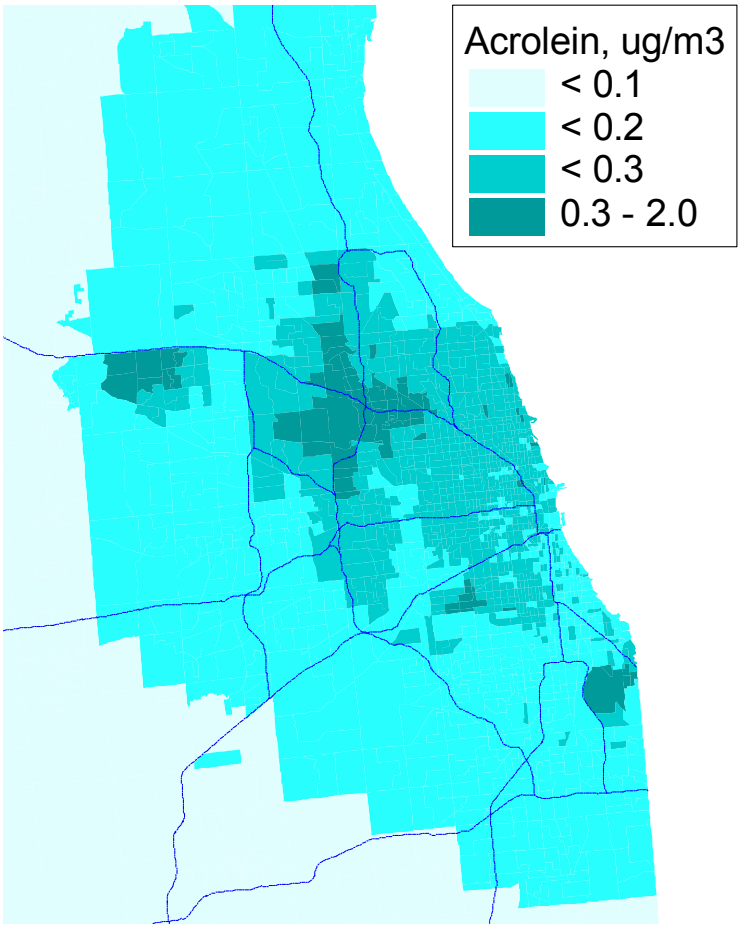


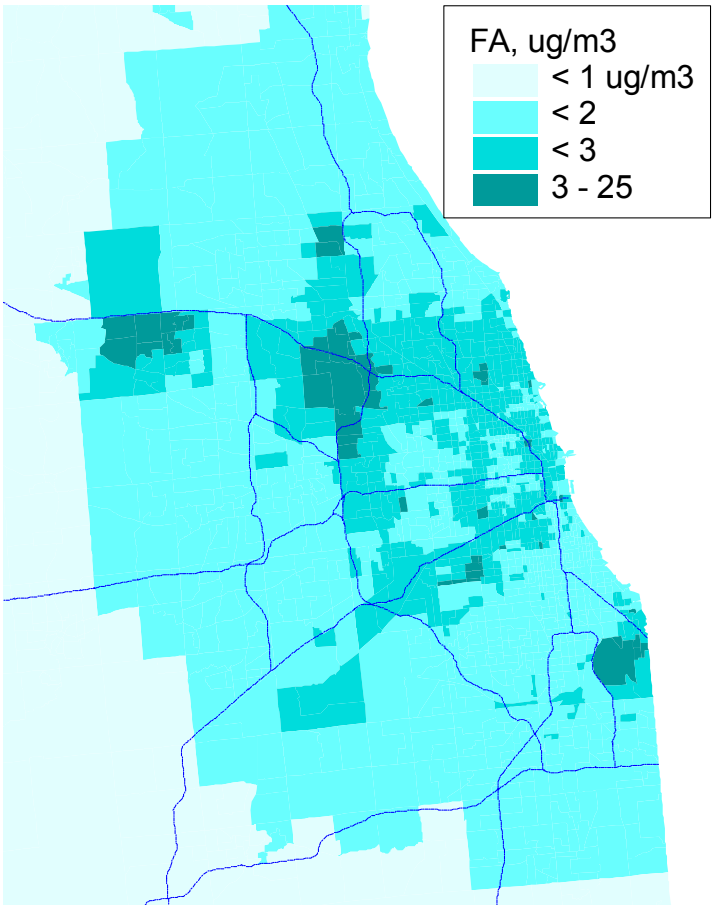
NATA VOCs: Carbon Tet, Chloroform



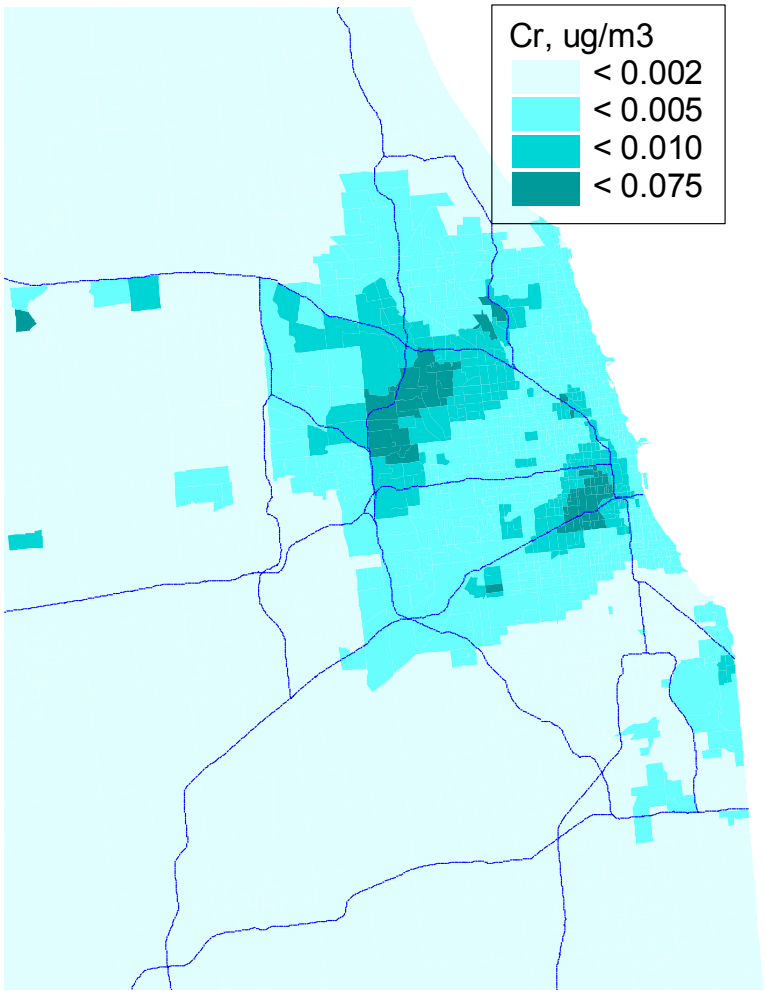


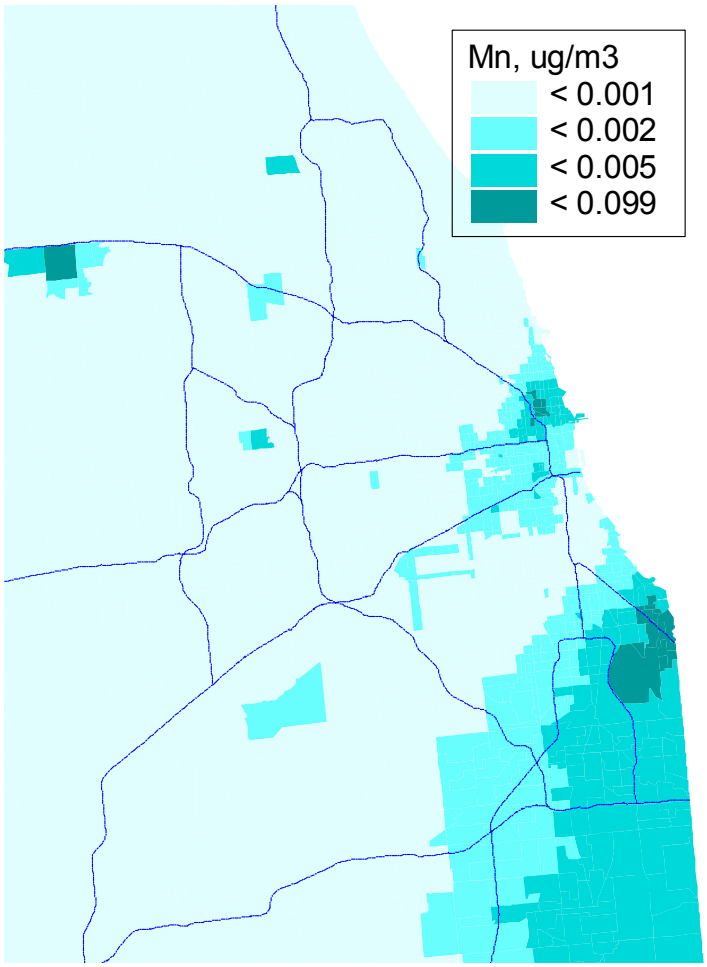
NATA Carbonyls: Acrolein, Formald.

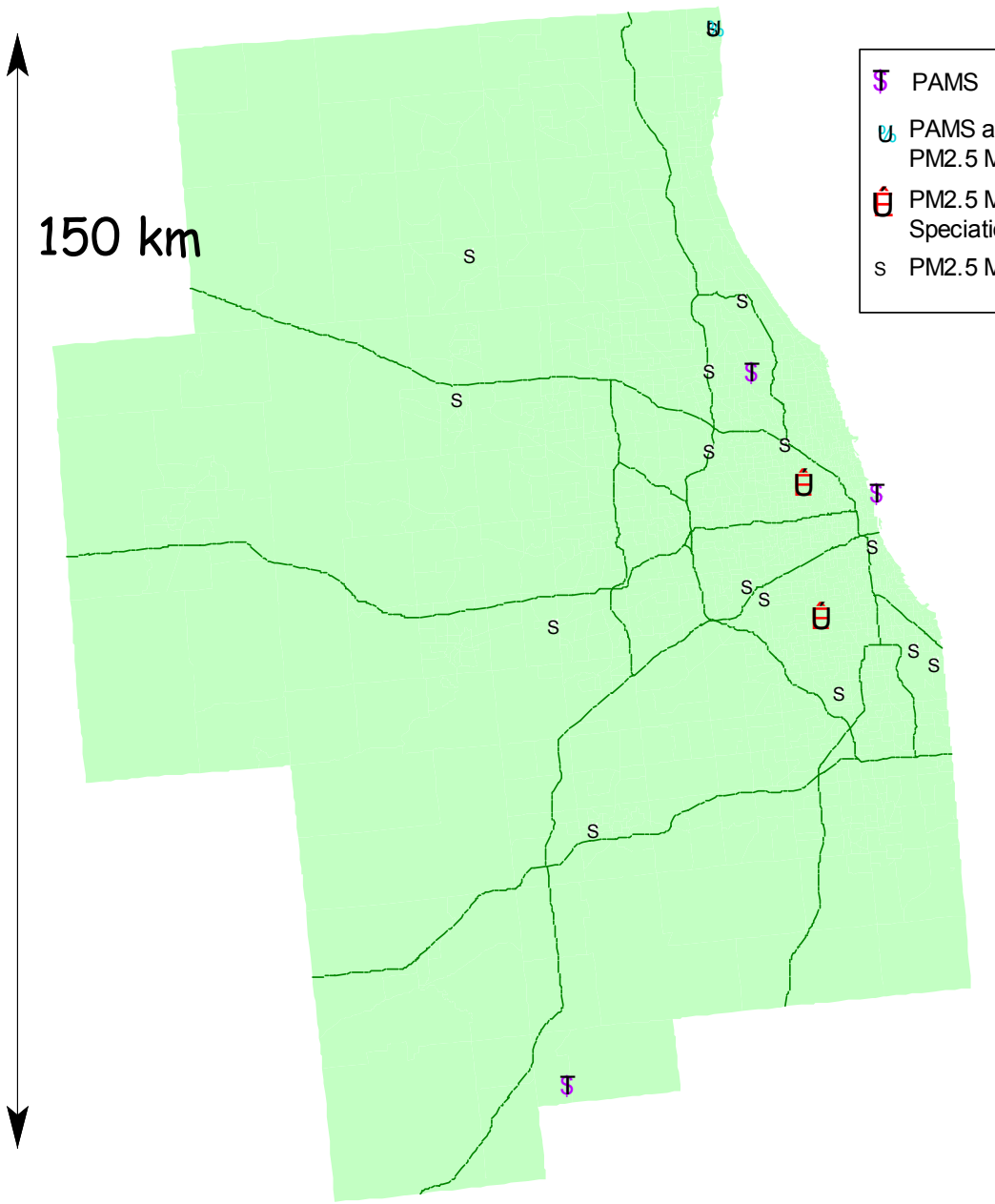




NATA Metals: Cr and Mn







EXISTING MONITORING SITES

BUDGETING

- New site start-up plus consumables will cost $10,000 per site (analysis $$ additional)
- Consumables at existing sites will cost $5,000 per site per year
- Equipment is already available for 3 VOC and 3 metals sites
- Travel and staffing costs are negligible
- Analytical costs (next slide) assume 70 samples per year; 1-in-6 day schedule

Annual Monitoring Cost per Site

	NEW EQUIPMENT	COST of ANALYSIS
VOCs	$3,500	$28,000
Carbonyls	$6,000	$8,000
Metals	$2,500	$8,000
Acrolein	n/a	$7,000
Hex-Chrome	$6,000	$15,000

VOCs = benzene, 1,3-butadiene, carbon tet, chloroform

Carbonyls = acetaldehyde, formaldehyde

Metals = total Cr, total Mn, and various other metals

Acrolein and Hex Chrome require separate procedure

Your First Year Budget is..

$500,000 !!

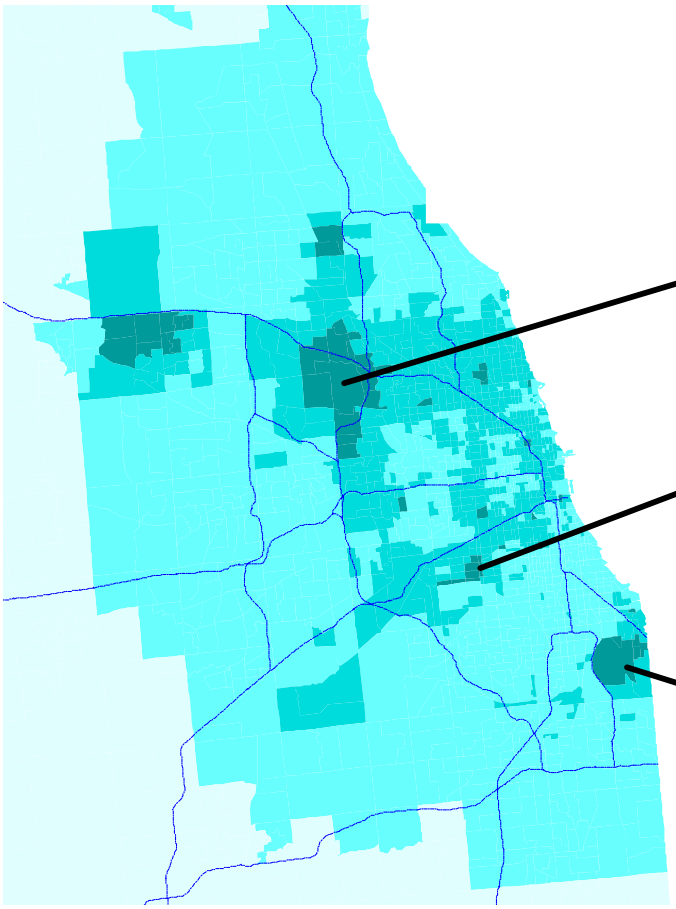
Please be prepared to explain:

- what were your priority pollutants?
- how did you select your monitor sites?
- how did you resolve budgeting issues?

NETWORK #2:

SMALL-SCALE LOCAL HOTSPOT

What's already been done?



O'Hare Airport
Monitoring study, 2000

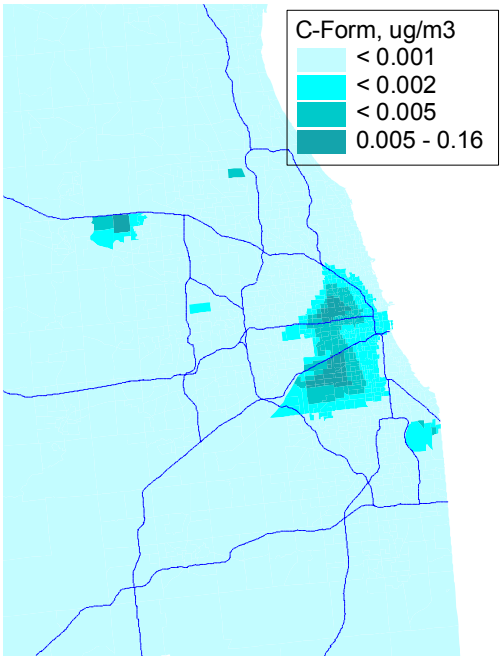
Midway Airport modeling
and risk assessment, 1993

SE Chicago modeling
and risk assessment, 1989
Monitoring study, 1996

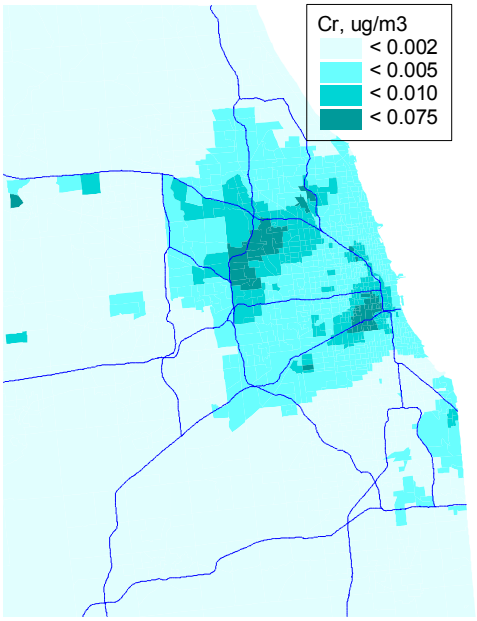
What remains to be studied?

- Various local hotspots, for example:

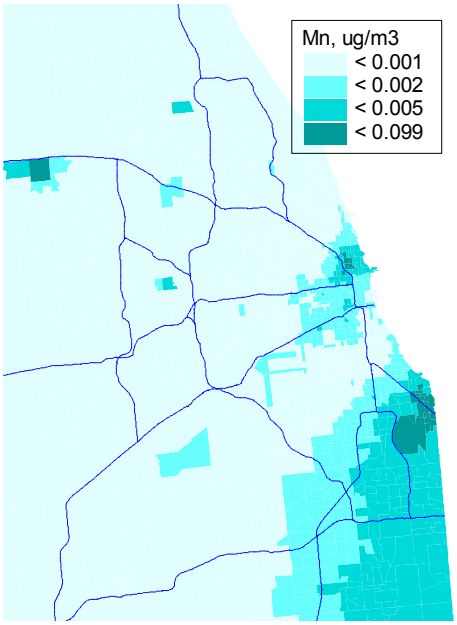
C-Form and C-Tet



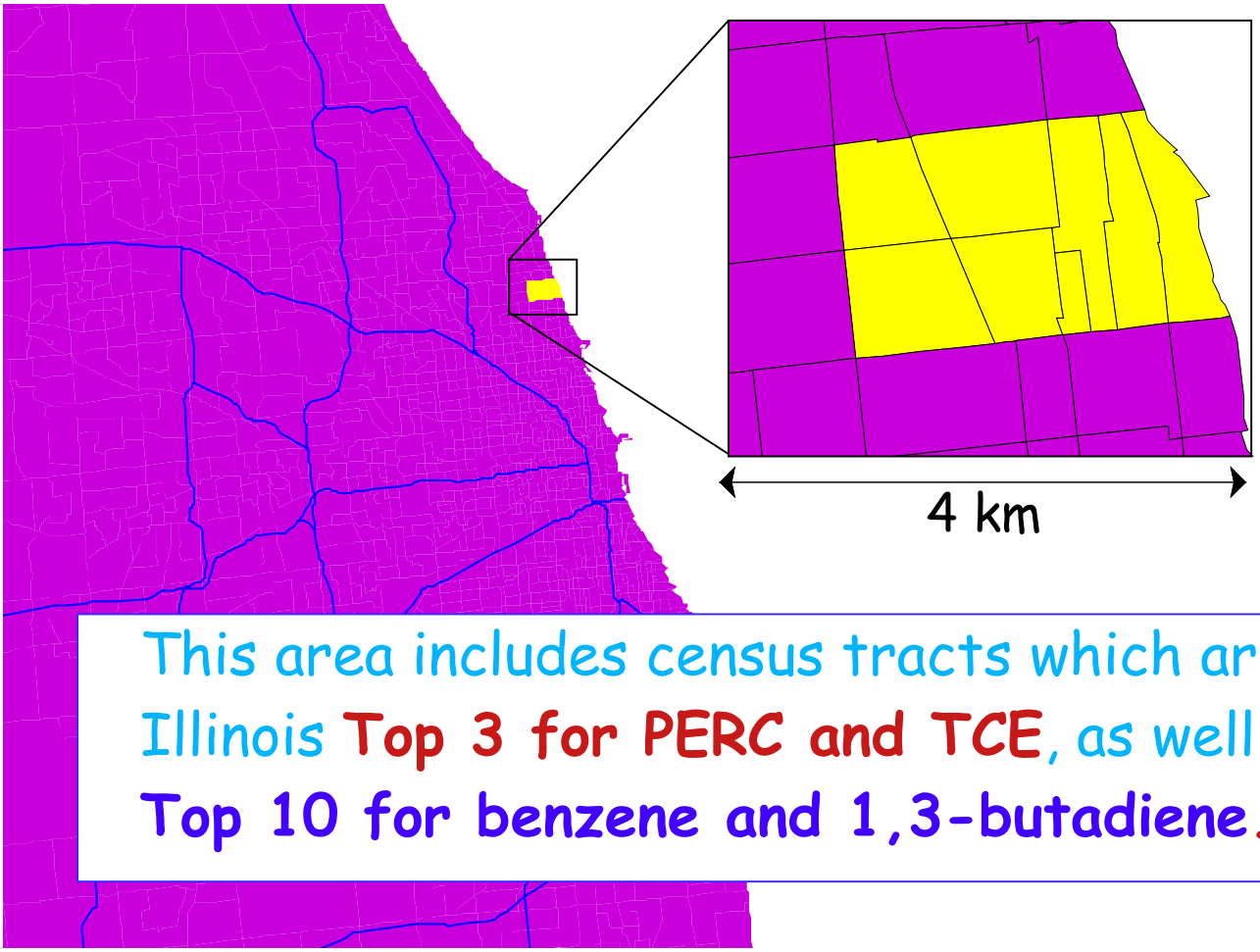
Chromium



Manganese



Rogers Park - VOC Hotspot?!



This area includes census tracts which are in the Illinois **Top 3 for PERC and TCE**, as well as the **Top 10 for benzene and 1,3-butadiene.**

YOUR TASK:

- Design a **small-scale VOC monitoring network**, in the spirit of Barrio Logan
- The objective of this network is to establish the range of concentrations for PERC and TCE, as well other key VOCs - benzene and 1,3-butadiene - within the study area
- Data should be useable for NATA validation and higher-resolution exposure assessment

DOs and DON'Ts

- **DO**
  - Try to find the areas of maximum exposure to PERC and TCE in the study area
  - Establish lower-concentration, upwind sites
  - Include areas where children spend time, i.e. schools, library, and park facilities
  - Select microscale (up to 100 meters) or middle scale (100 - 500 meters) sites
- **DON'T**
  - Feel obliged to operate all monitors all year.

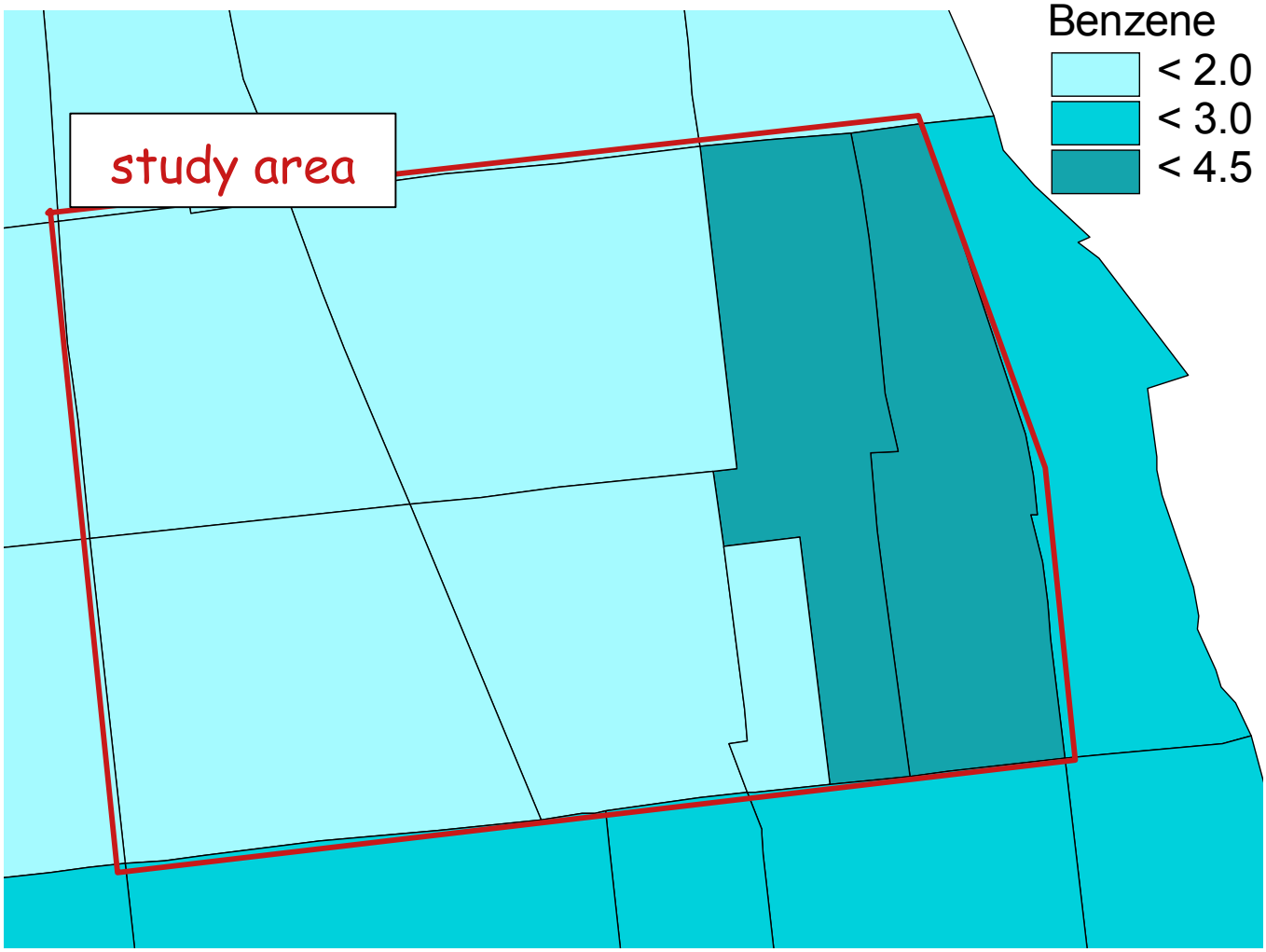
About Rogers Park

- 10 miles north of the Loop
- One of the most culturally diverse neighborhoods in Chicago and the nation - more than 80 languages spoken among the 63,000 residents. Many emigrants of Asia, Africa, and Latin America.
- 75% of homes are rental property

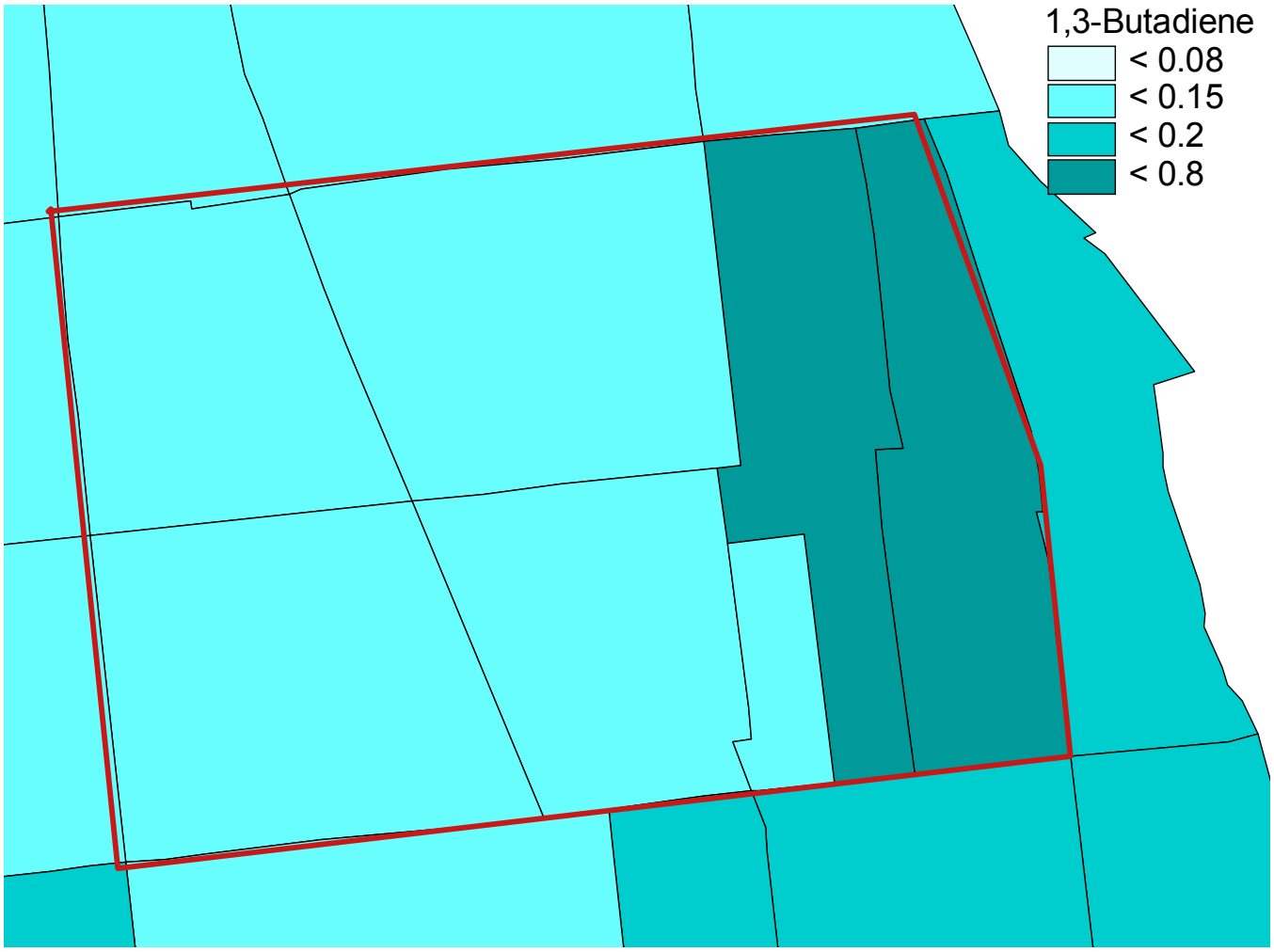
NATA census tract level data - don't try this at home

- Census tract data provide the "typical" ambient concentration in the tract, i.e. at census tract **centroid**, not the average.
- NATA estimates rely on imperfect emissions inventory information.
- This information is best used to identify larger patterns, not to draw conclusions about specific census tracts.

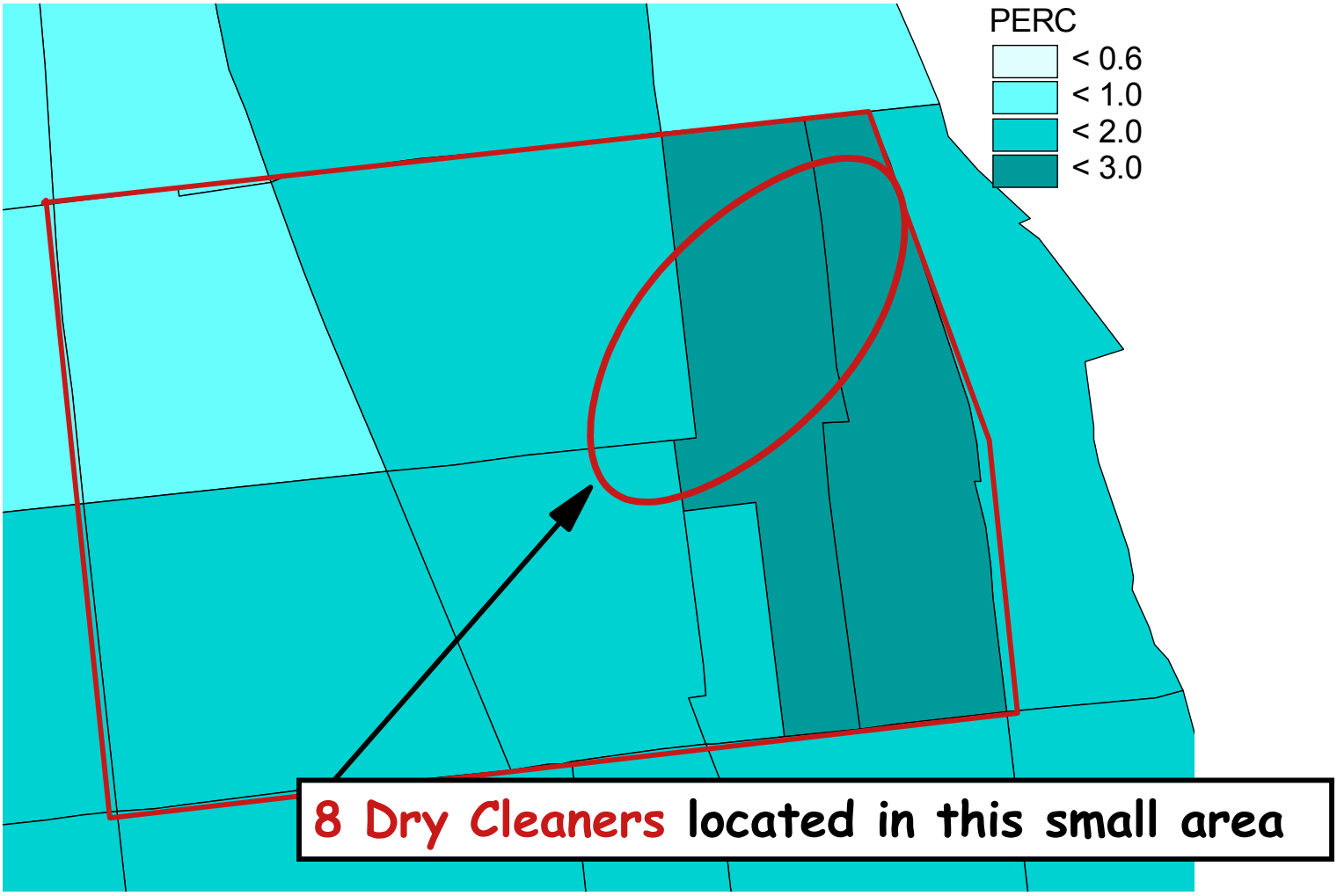
NATA Estimated Benzene



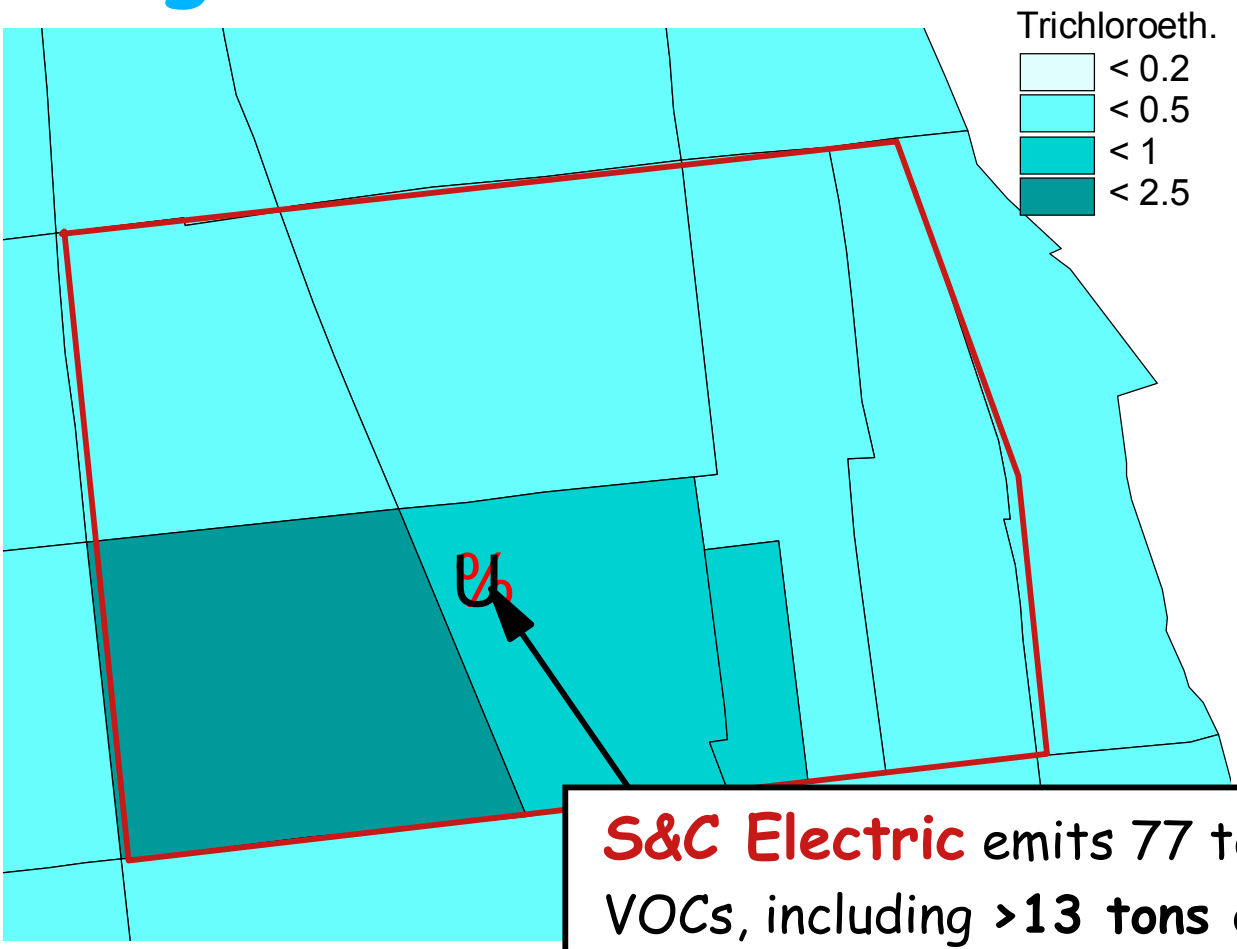
NATA 1,3-Butadiene



Highest PERC levels in Illinois!?



Highest TCE levels in Illinois!?

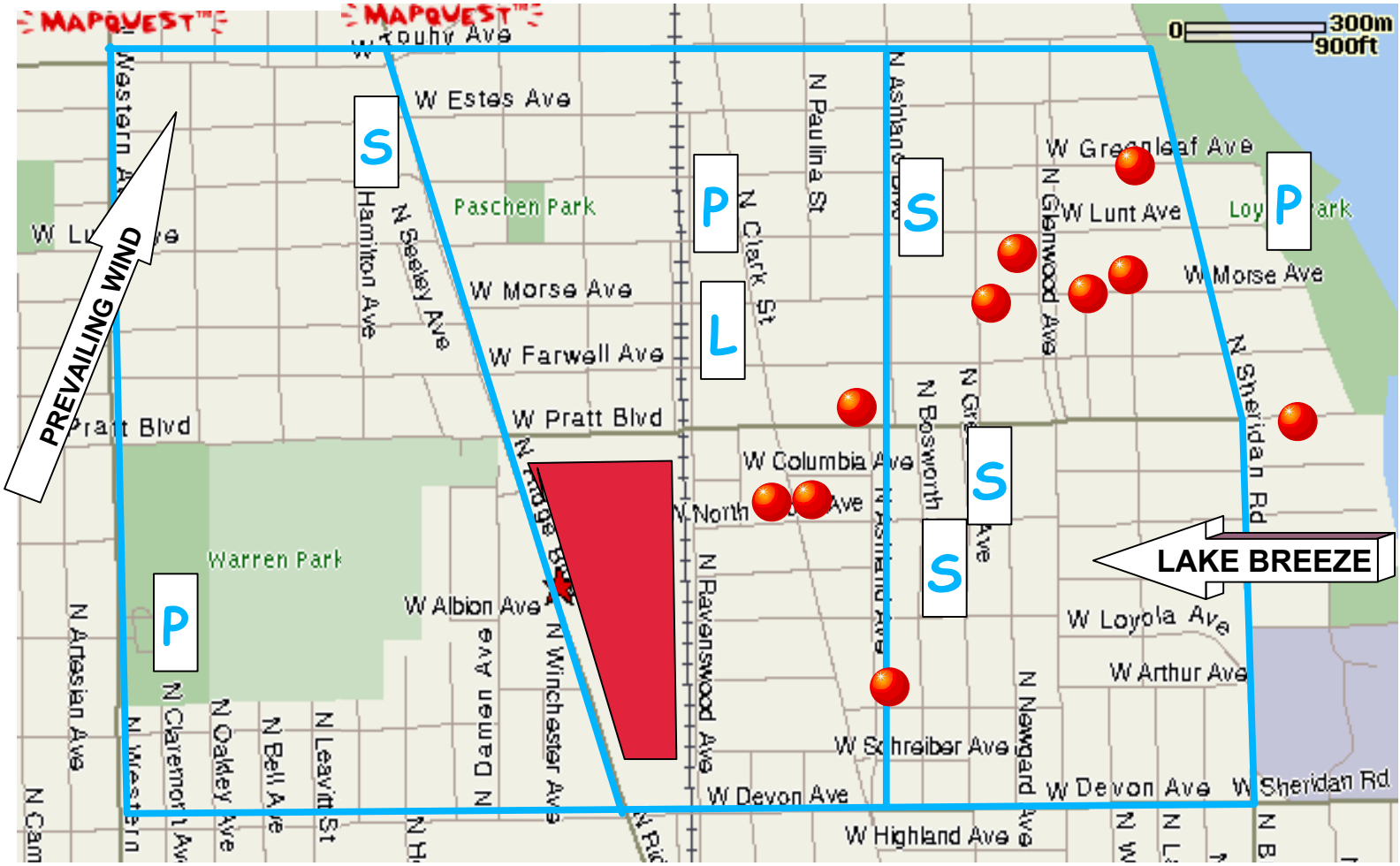


S&C Electric emits 77 tons/year VOCs, including **>13 tons of TCE**

Budget, etc.

- There are no existing monitors in the area
- Siting new monitors at public buildings (schools, libraries, etc.) is most convenient.
- Other costs apply - see earlier slides.
- Consider establishing a small number of long-term fixed monitors and numerous short-term mobile monitors. *(Hint: short-term sites can be established indoors.)*

Study area


MAPQUEST
MAPQUEST
0
300m
900ft
PREVAILING WIND
W Estes Ave
W Morse Ave
W Farwell Ave
W Pratt Blvd
W Albion Ave
W Columbia Ave
W Devon Ave
W Highland Ave
W Greenleaf Ave
W Lunt Ave
W Loyola Ave
W Arthur Ave
W Schreiber Ave
Paschen Park
Warren Park
N Hamilton Ave
N Seeley Ave
N Clark St
N Paulina St
N Ashland Ave
N Bosworth
N Glenwood Ave
N Sheridan Rd
N Ravenswood Ave
N Winchester Ave
N Damen Ave
N Artesian Ave
N Oakley Ave
N Bell Ave
N Leavitt St
N Newgard Ave
LAKE BREEZE
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Your Operating Budget is..

$250,000 !!

Please be prepared to explain:

- how did you select your monitor sites?
- how did you resolve budgeting issues?
- how did you mix short and long-term sites?